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DEPARTMENT OF THE AIR FORCE  
AFCERS AIR FORCE CIVIL ENGINEERING SUPPORT GROUP  
TYNDALL AIR FORCE BASE FL 32403-5301

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18 AUG 1993

HQ AFCESA/EN  
REPLY TO:  
ATTN TO:  
139 Barnes Drive, Suite 1  
Tyndall AFB FL 32403-5319

SUBJECT: Engineering Technical Letter (ETL) 93-3, Inventory, Screening, Prioritization, and Evaluation of Existing Buildings for Seismic Risk

to: Distribution List

1. Purpose. This letter provides instructions for assigning a seismic risk code for existing Air Force buildings. The method for determining the priority for performing an evaluation for seismic risk of existing buildings on an installation is defined. The risk code will be used for identifying on an inventory existing buildings which require seismic hazard mitigation, and it identifies a mechanism for vertical reporting of the inventory to agencies outside the Air Force.

2. Application. This ETL is effective immediately and must be sent to all installations. The intent is to implement those portions of the National Earthquake Hazards Reduction Program (NEHRP) identified in Public Laws 95-124 and 101-614, as amended. The objective of this ETL is to identify buildings which do not meet life-safety criteria. Nothing in this ETL precludes evaluation of a building for higher performance objectives.

3. References.

3.1 Seismic Design for Buildings, AFM 88-3, Chap 13, October 1992.

3.2 Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook, Federal Emergency Management Agency (FEMA), FEMA 154, July 1988.

3.3 NEHRP Handbook for Seismic Rehabilitation of Existing Buildings, FEMA 172, June 1992.

3.4 NEHRP Handbook for the Seismic Evaluation of Existing Buildings, FEMA 178, June 1992.

3.5 1991 Edition, NEHRP Recommended Provisions for the Development of Seismic Regulations for New Buildings (including Maps), Part 1, Provisions, FEMA 222, January 1992.

3.6 1991 Edition, NEHRP Recommended Provisions for the Development of Seismic Regulations for New Buildings, Part 2, Commentary, FEMA 223, January 1992.

4. Definitions.

93-20131

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**4.1 Building.** Any structure, fully or partially enclosed, used or intended for sheltering persons or property. Does not include bridges, transmission towers, industrial towers and equipment, or hydraulic structures.

**4.2 Hazards.** A source of danger with potential to cause illness, injury, or death to persons or damage to a facility or the environment.

**4.3 Seismic Risk Inventory.** An inventory of all buildings under the jurisdiction of an agency which are categorized in order to determine each building's relative probability of presenting an unacceptable seismic risk to life safety.

**4.4 Evaluation.** A procedure the purpose of which is to determine whether life-safety risks exist in a building.

**4.5 Mitigation.** The substantial reduction of life-safety risk from seismic hazards involving a building and/or building site. Examples include demolition, permanent evacuation, change in occupancy, and rehabilitation.

**4.6 Risk.** The quantitative or qualitative expression of possible loss that considers both the probability that a hazard will cause harm and the consequences of that event.

**4.7 Building Configuration.** Either regular or irregular. Regular configurations have uniform proportions which retain a compact architectural form. Irregular configurations include abrupt changes in geometric shape (either plan or profile), large in plan, excessive length-to-width proportions, or center of mass not coincident with center of resistance. Irregularity does include interruption of structural elements and abrupt changes in lateral stiffness. Large plan buildings, such as aircraft hangars or warehousing, are irregular because the building will be responding to different modes because of the long spans used in the construction. The more significant of the irregular configurations includes the "soft story" (ground-level story is less stiff than those above), discontinuous shear walls (location different between floors), and reentrant corners (L-shape).

## **5. Specific Requirements.**

**5.1 Seismic Zone Identification.** The base (or installation) shall define the seismic zone by using the NEHRP Map Seismic Zone Identification using the county and state of the base location. Reference 1991 Edition of FEMA 222, 1991 NEHRP Recommended Provisions for the Development of Seismic Regulations for New Buildings, Map 2. The respective MAJCOM shall concur in the seismic zone identification. Site-specific geologic studies are necessary when mapping does not clearly

define the seismic activity potential or when transition areas between mapping zones are evident. The seismic zone identification will be a part of the seismic risk code which is described in paragraph 5.6. The risk code should be developed as the inventory, screening, and evaluation process evolves.

5.2 Building Inventory. A list will be prepared which includes each building which is on the real property records of the respective base or installation.

5.2.1 The list will include building number, function, the square footage, the date of design/construction, the estimated replacement value, and the seismic risk code which will be assigned using the criteria of paragraph 5.6. The list may include commentary which will allow for noting dates of any rehabilitation, interior renovation, additions, etc. Function shall be simple terminology which defines the building use; i.e., administrative, dining hall, dormitory, aircraft hangar, etc. Function is used as a trigger to define potential risk due to building occupancy. Use the highest risk occupancy where multiple uses are encountered.

5.2.2 Designate a performance objective category for each building on the inventory using Table I. (Reference AFM 88-3, Chap 13, Para 3-6). The performance objective category will become a part of the seismic risk code described in paragraph 5.6. A performance objective category of II or IIR is not used because the Category II - Hazardous Facilities, as defined in AFM 88-3, Chap 13, are included within performance objective category I or IR.

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Larry Spangler AFCESA/EN  
Tyndall AFB FL 32403-5319

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TABLE I  
Performance Objective Categories

<u>CODE</u>	<u>DESCRIPTION</u>
IR	Immediate Occupancy (Category I - Essential) Regular Configuration - Function of the building is to shelter a function at minimum disruption but some nonstructural repairs and cleanup will be required. The building would remain occupied and functional during an earthquake event and/or the building houses a function necessary for post-disaster recovery. Includes Damage Control (Category II - Hazardous Facilities). Examples would include hospitals, fire stations, communications (includes aircraft control towers), disaster preparedness offices (command and control), weapons storage, petroleum storage, chemical storage, etc.
I	Immediate Occupancy (Category I - Essential) Irregular Configuration.
IIIR	High Risk (Category III - Special Occupancy Structures) Regular Configuration - Buildings where primary occupancy is for assembly of large numbers of people, confinement of people (prisons), or the building houses a service for a large number of other buildings, or the building shelters high-value equipment. Examples would include theaters, dormitories, dining halls, aircraft hangars, central heat plants, water treatment plants, etc. Does not include family housing unless there are more than two families within one building.
III	High Risk (Category III - Special Occupancy Structures) Irregular Configuration.
IVR	Other Buildings (Category IV - Standard Occupancy) Regular Configuration - Includes all buildings not included in the other categories.
IV	Other Buildings (Category IV - Standard Occupancy) Irregular Configuration.
V	Other Hazards (Category V - Structural Exemption) - Category V includes buildings which are exempt from Structural Evaluation described in paragraph 5.7. A building will be in category V because it is exempt by paragraph 5.3, it is a benchmark building defined in paragraph 5.4, or it has been mitigated. For any of the three structural exemptions, it is placed into the inventory for further evaluation for nonstructural hazards. A building which has been cleared for seismic risk because of nonstructural hazards will be removed from the seismic inventory.

**5.3 Building Screening.** Within each performance objective category, screen each building for those buildings which will be exempt from structural evaluation. Buildings exempt from structural evaluation will remain on the seismic risk inventory but shall be placed within performance objective Category V - Other Hazards. Category V buildings may be removed from the seismic risk inventory when each is found to comply with the nonstructural hazards evaluation described in paragraph 5.9, Other Hazards. Exempt buildings include the following:

5.3.1 Buildings intended only for incidental human occupancy. The exemption applies only to substantial life-safety performance.

5.3.2 One and two family dwellings, less than two stories, that are located in NEHRP map zones with a value of  $A_V$  less than 0.15.

5.3.3 Buildings of gross square footage less than 500 square feet.

5.3.4 Buildings of light metal or wood construction, one-story in height, and less than 3000 square feet of gross floor area.

**5.4 Building Prioritization.** Within each performance objective category, the respective buildings shall be listed by NEHRP common construction type. Common construction types are defined in NEHRP Handbook for the Seismic Evaluation of Existing Buildings, FEMA-178, June 1992. For each construction type, identify the benchmark year and compare that year to the year of construction for each building within the performance category. Buildings designed after the benchmark year will be listed in performance objective Category V - Structural Exemptions. Buildings which have been rehabilitated for seismic deficiencies since the benchmark year and which meet the minimum evaluation criteria of FEMA 178 shall be placed in Category V.

5.4.1 Within each performance objective category, rank order the buildings beginning with those of common building type 15, proceeding to the next lower number. For those buildings of the same construction type, the buildings should be listed in order of the "perceived risk" based upon visual judgements by the people doing the technical portion of the screening. The publication FEMA 154/July 1988, Rapid Visual Screening of Buildings for Potential Seismic Risks, can be used to assist with building prioritization. Begin priority numbering with one (1) at the top of the list within each performance category and proceed down the list. There will be new priority ordering within each performance category.

5.4.2 Any building identified during the prioritization which is an "unreasonable risk;" i.e., a hospital constructed of unreinforced masonry in Seismic Zone 7 will be evaluated immediately using the procedures of paragraph 5.7, Order of Evaluation.

5.5 Seismic Risk Group Identification. Each building on the seismic risk inventory shall be placed into a seismic risk group. Risk group assignment shall be made by each major command for all buildings within the command. HQ AFCESA/ENC will provide technical oversight of risk group assignment as a means of assuring that equal distribution of risk group buildings is effected across the Air Force. The risk group assignments will be made within risk group assignment criteria given in Table II.

TABLE II

RISK GROUP ASSIGNMENT CRITERIA

Risk Group A: The highest priority group of buildings on the seismic risk inventory which may require seismic hazard mitigation.

Risk Group B: The second highest priority group of buildings on the seismic risk inventory which may require seismic hazard mitigation. Included in Risk Group B will be buildings within NEHRP Map Zones with an  $A_v$  value greater than 0.15 and less than 0.20.

Risk Group C: The lowest priority group of buildings in an agency building inventory which may require seismic hazard mitigation. Group C shall be subdivided into Risk Group  $C_2$  and  $C_1$  for NEHRP Map Zones 4 and 3 and 2 and 1, respectively.

General Guidance: Risk Groups A and B shall together include all nonexempt buildings located in NEHRP Map areas 5, 6, and 7. Risk Group C shall include all buildings in NEHRP Map Zones 4, 3, 2, and 1 and shall include all post-benchmark buildings which have not been evaluated for other seismic hazards. Risk Group A shall include all buildings in Performance Category I, IR, III and all buildings of common construction type 11 and higher regardless of performance category.

5.6 Seismic Risk Code Assignment. The seismic risk code will identify each building on the real property inventory for seismic risk designation. The risk code will be in four parts, each of which is described in Table III.

TABLE III

SEISMIC RISK CODE  
W / XXXX / YY YY / ZZZ Z

W	NEHRP Seismic Zone, 1 thru 7
XXXX	Building performance objective category described in Para 5.2.
YY YY	Building common construction type (1 thru 15) and construction year.
ZZZ Z	Base priority of evaluation and mitigation within each performance objective category by building construction type. The last digit will be the Seismic Risk Group "A", "B", "C <sub>2</sub> ", or "C <sub>1</sub> " assigned by MAJCOM.

5.7 Order of Evaluation. Each building on the seismic hazard inventory will be evaluated using FEMA 178. The order of evaluation should start with all Risk Group "A" buildings, Performance Objective Category I, Priority 1. Exception to the order shall be for those buildings which will go directly to evaluation under "Trigger Criteria" described in paragraph 5.8, Immediate Evaluation or "Trigger Criteria." All buildings which are evaluated using FEMA 178 procedures which fail the seismic risk evaluation shall be programmed for mitigation using available programming and budgeting procedures. All buildings which fail the FEMA 178 evaluation procedures will remain on the seismic risk inventory until mitigation has been effected.

5.7.1 Each base or installation shall accomplish a geological evaluation using the criteria in FEMA 178, Section 9, prior to doing evaluations for each building. The geologic hazard evaluation shall define the appropriate seismic demands and shall provide evaluation statements for each foundation type located on the base or installation.

5.7.2 When buildings in Performance Category I are evaluated, the evaluation shall continue with all buildings in Performance Objective Category III, followed by buildings listed in Category IR. For Risk Group "A," all building construction types 15, 14, 13, and 11 are next evaluated in their respective orders of priority within their respective performance category. The next order of evaluation is for buildings in Performance Objective Categories IV, IIIR and IVR, respectively.

5.7.3 Risk Group "A" buildings are followed by Risk Group "B", followed by Risk Group "C," using the above order of evaluation. However, there is no precedence for doing all of "A" before starting "B" since MAJCOMs may consider buildings in Performance Objective Category I in Group "B" of higher priority than buildings in Group "A," Category IR, etc. The general priority of execution should be maintained and not cease while doing Group "A" to do some Group "B," etc.

5.7.4 Matrix charts which illustrate the order of evaluation are provided as Fig 1, Matrix Priority of Buildings by Performance Objective Category, and Fig 2, Matrix Priority of Building Evaluations by Type.

5.8 Immediate Evaluation or "Trigger Criteria." A building shall be immediately evaluated when any of the following situations occur and the building has not been evaluated or exempted under the auspices of the seismic program.

5.8.1 There is a change in a building's use which will result in the building being placed in a higher priority performance category.

5.8.2 When there is a project planned to renovate or make improvements to the building which when accomplished will cost more than 50 percent of the replacement value of the building.

5.8.3 When the building has been damaged by fire, wind, earthquake, or other cause to the extent that it is estimated that there is less than 75 percent of the original structural strength or stability.

5.8.4 When there is a building modification which will reduce the shear capacity of any single story by 10 percent or more.

5.8.5 When there is an "obvious" seismic risk which is more than a substantial life-safety level of protection.

5.8.6 When there is a building addition to the seismic risk inventory after the initial inventory and screening is accomplished.

5.9 Other Hazards for Evaluation. Each building on the seismic risk inventory shall be evaluated for nonstructural risk using the criteria of FEMA 178, Section 10. Nonstructural evaluation procedures will be defined by each MAJCOM for each respective base or installation. A copy of the nonstructural evaluation criteria and implementation plan will be coordinated with HQ AFCESA/ENC to assure compliance with NEHRP guidance.

5.10 Disposition of Seismic Risk Inventory. FEMA is required by public law to report to Congress on the progress made by each federal agency to meet NEHRP goals. The reporting will be in two-year cycles beginning in July 1996. Each MAJCOM will compile a seismic risk inventory for submittal to HQ AFCESA/ENC each two years beginning in April 1996. The MAJCOM seismic risk inventory report submitted to HQ AFCESA will include total number of buildings by performance objective category for each seismic risk group. The report will include the total number of buildings which are programmed for mitigation and estimated costs for mitigation in the five-year period following the year of reporting. The seismic risk inventory format will be provided to each MAJCOM by HQ AFCESA/ENC.

5.10.1 The seismic risk inventory will be updated as each building is screened, evaluated, and mitigated.

5.10.2 The office which will be responsible for maintenance of the seismic risk inventory will be designated by each MAJCOM.5.

6. The point of contact for this ETL is Mr James L. Lafrenz, HQ AFCESA/ENC, (904) 283 6332 or DSN 523 6332.



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1. Distribution List
  2. ETL Index
  3. Figure 1
  4. Figure 2

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**ENGINEERING TECHNICAL LETTERS (ETL)**

**SECTION A - CURRENT ETLs**

<b>ETL Number</b>	<b>Title</b>	<b>Date Issued</b>
82-2	Energy Efficient Equipment	10 Nov 82
83-1	Design of Control Systems for HVAC Change No. 1 to ETL 83-1, U.S. Air Force Standardized Heating, Ventilating & Air Conditioning (HVAC) Control Systems	16 Feb 83
83-3	Interior Wiring Systems, AFM 88-15 Para 7-3	22 Jul 87
83-4	EMCS Data Transmission Media (DTM) Considerations	2 Mar 83
83-7	Plumbing, AFM 88-8, Chapter 4	3 Apr 83
83-8	Use of Air-to-Air Unitary Heat Pumps	30 Aug 83
83-9	Insulation	15 Sep 83
84-2	Computer Energy Analysis Change 1 Ref: HQ USAF/LEEEU Msg 031600Z MAY 84 1 Jun 84	14 Nov 83
84-7	MCP Energy Conservation Investment Program (ECIP)	27 Mar 84
84-10	Air Force Building Construction and the Use of Termiticides	13 Jun 84
86-2	Energy Management and Control Systems (EMCS)	1 Aug 84
86-4	Paints and Protective Coatings	5 Feb 86
86-5	Fuels Use Criteria for Air Force Construction	12 May 86
86-8	Aqueous Film Forming Foam Waste Discharge Retention and Disposal	22 May 86
86-9	Lodging Facility Design Guide	4 Jun 86
86-10	Antiterrorism Planning and Design Guidance	4 Jun 86
86-14	Solar Applications	13 Jun 86
86-16	Direct Digital Control Heating Ventilation and Air Conditioning Systems	15 Oct 86
87-1	Lead Ban Requirements of Drinking Water	9 Dec 86
87-2	Volatile Organic Compounds	15 Jan 87
87-4	Energy Budget Figures (EBFs) for Facilities in the Military Construction Program	4 Mar 87
87-5	Utility Meters in New and Renovated Facilities	13 Mar 87
87-9	Prewiring	13 Jul 87
88-2	Photovoltaic Applications	21 Oct 87
88-3	Design Standards for Critical Facilities	21 Jan 88
88-4	Reliability & Maintainability (R&M) Design Checklist	15 Jun 88
88-6	Heat Distribution Systems Outside of Buildings	24 Jun 88
		1 Aug 88

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## ENGINEERING TECHNICAL LETTERS (ETL)

### SECTION A - CURRENT ETLs

ETL Number	Title	Date Issued
88-9	Radon Reduction in New Facility Construction	7 Oct 88
88-10	Prewired Workstations Guide Specification	29 Dec 88
89-2	Standard Guidelines for Submission of Facility Operating and Maintenance Manuals	23 May 89
89-3	Facility Fire Protection Criteria for Electronic Equipment Installations	9 Jun 89
89-4	Systems Furniture Guide Specification	6 Jul 89
89-6	Power Conditioning and Continuation Interfacing Equipment (PCCIE) in the Military Construction Program (MCP)	7 Sep 89
89-7	Design of Air Force Courtrooms	29 Sep 89
90-1	Built-Up Roof (BUR) Repair/Replacement Guide Specification	23 Jan 90
90-2	General Policy for Prewired Workstations and Systems Furniture	26 Jan 90
90-3	TEMPEST Protection for Facilities Change 1 Ref: HQ USAF/LEEDE Ltr dated 20 April 90, Same Subject	20 Apr 90
90-4	1990 Energy Prices and Discount Factors for Life-Cycle Cost Analysis	24 May 90
90-5	Fuel and Lube Oil Bulk Storage Capacity for Emergency Generators	26 Jul 90
90-6	Electrical System Grounding, Static Grounding and Lightning Protection	3 Oct 90
90-7	Air Force Interior Design Policy	12 Oct 90
90-8	Guide Specifications for Ethylene Propylene Diene Monomer (EPDM) Roofing	17 Oct 90
90-9	Fire Protection Engineering Criteria for Aircraft Maintenance, Servicing, and Storage Facilities	2 Nov 90
90-10	Commissioning of Heating, Ventilating, and Air Conditioning (HVAC) Systems Guide Specification	17 Oct 90
91-1	Fire Protection Engineering Criteria Testing Halon Fire Suppression Systems	2 Jan 91
91-2	High Altitude Electromagnetic Pulse (HEMP) Hardening in Facilities	4 Mar 91
91-3	Water Supply for Fire Protection	14 Jun 91
91-4	Site Selection Criteria for Fire Protection Training Areas	14 Jun 91
91-5	Fire Protection Engineering Criteria - Emergency Lighting and Marking of Exits	18 Jun 91
91-6	Cathodic Protection	3 Jul 91

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## ENGINEERING TECHNICAL LETTERS (ETL)

### SECTION A - CURRENT ETLs

ETL Number	Title	Date Issued
91-7	Chlorofluorocarbon (CFC) Limitation in Heating, Ventilating and Air-Conditioning (HVAC) Systems	21 Aug 91
93-1	Construction Signs	11 Mar 93
93-2	Dormitory Criteria for Humid Areas	13 Jul 93
93-3	Inventory, Screening, Prioritization, and Evaluation of Existing Buildings for Seismic Risk	18 Aug 93

### SECTION B - OBSOLETE ETLs

No.	Date	Status
82-1	10 Nov 82	Superseded by ETL 83-10, 86-1, 87-4
82-3	10 Nov 82	Superseded by ETL 83-5, 84-2
82-4	10 Nov 82	Superseded by ETL 84-7
82-5	10 Nov 82	Superseded by ETL 84-1, 86-13, 86-14
82-6	30 Dec 82	Cancelled
82-7	30 Nov 82	Cancelled
83-2	16 Feb 83	Superseded by ETL 84-3
83-5	5 May 83	Superseded by ETL 84-2
83-6	24 May 83	Cancelled
83-10	28 Nov 83	Superseded by ETL 86-1
84-1	18 Jan 84	Superseded by ETL 86-14
84-3	21 Mar 84	Cancelled
84-4	10 Apr 84	Superseded by ETL 86-7, 86-15, 87-5
84-5	7 May 84	Superseded by ETL 84-8, 86-11, 86-18, 88-6
84-6	Not Issued	Cancelled/Not Used
84-8	19 Jun 84	Superseded by ETL 86-11
84-9	5 Jul 84	Superseded by ETL 88-7
88-5	2 Aug 88	Superseded by ETL 91-6
86-1	3 Feb 86	Superseded by ETL 87-7
86-3	21 Feb 86	Superseded by ETL 86-4
86-6	3 Jun 86	Superseded by ETL 86-11, 86-18, 88-6
86-7	3 Jun 86	Superseded by ETL 86-15
86-11	3 Jul 86	Superseded by ETL 88-6
86-12	3 Jul 86	Superseded by ETL 90-2
86-13	18 Aug 86	Superseded by ETL 86-14
86-15	13 Nov 86	Superseded by ETL 87-5
86-17	17 Dec 86	Superseded by ETL 89-6
86-18	18 Dec 86	Superseded by ETL 88-6
87-3	12 Mar 87	Superseded by ETL 87-6, ETL 88-5
87-6	21 Aug 87	Superseded by ETL 88-5
87-7	14 Oct 87	Superseded by ETL 89-1
87-8	19 Oct 87	Superseded by ETL 90-1
88-1	5 Jan 88	Superseded by ETL 89-2
88-7	24 Aug 88	Superseded by ETL 90-3, ETL 91-2
88-8	4 Oct 88	Superseded by ETL 91-7
89-1	6 Feb 89	Superseded by ETL 90-4
89-5		Issued as ETL 90-7
91-8	24 Sep 91	Cancelled

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## FIG 1. - EVALUATION OF BUILDINGS

Matrix Priority of Buildings by Performance Objective Category

		Performance Objective Category		
		1	2	3
		1	2	3
A	I	III	IV	IV
	IR	IIIR	IVR	IVR
B	I	III	IV	IV
	IR	IIIR	IVR	IVR
C	I	III	IV	IV
	IR	IIIR	IVR	IVR

Risk Group

NOTE: Order of precedence for evaluation shall begin with those buildings in matrix position (1,1) and proceed to those in position (2,1), (1,2), (3,1), (2,2), (1,3), etc. proceeding down to the right.

## **FIG 2. - EVALUATION OF BUILDINGS**

### **Matrix Priority of Building Evaluations by Type**

**NOTE: Order of evaluation within each performance objective category begins with the building type which has the highest number designator and proceeds to the lowest number.**

**MATRIX LOCATION 1 FROM FIG 1.**

BLDG 1210 - INFIRMIRY, 7/1 /15 58/001 A  
BLDG 1360 - FIRE STATION, 7/1 /12 72/002 A  
BLDG 0745 - AIR POLICE HQS, 7/1 /10 88/003 A

MATRIX  
LOCATION 1  
FROM FIG 1.



BLDG 0333 - COMMAND POST, 7/1 /6 74/012 A